REMARKS

Claims 1-4 and 9-29 are pending after this amendment. The Applicant respectfully submits that these claims patentably distinguish the prior art of record and are in condition for allowance.

US Patent No. 5,998,066 (Block et al.)

The Office Action raises Block et al. in connection with originally filed claims 1-16. The Applicant submits that the currently pending claims patentably distinguish Block et al.

As understood by the Applicant, Block et al. discloses a method of producing a gray scale mask using an inorganic chalcogenide glass, such as selenium germanium (Se-Ge) coated with a thin layer of silver (Ag). As shown in Figures 1-6 and explained in the accompanying description at col. 6, ln. 24 - col. 7, ln. 36, a Se-Ge film (102) is applied to a transparent substrate (100) and then a film of Ag (104) is applied atop the Se-Ge. The Ag layer is then imagewise irradiated with an electron beam in accordance with a gray scale pattern. In imaged areas, the electron beam writing causes the Ag to diffuse into the Se-Ge layer forming a resultant Ag-Se-Ge material (see Figure 4 and col. 6, lns. 56-59). The resultant Ag-Se-Ge material has a different solubility in alkaline solutions from the precursor layers.

After electron beam imaging, both the Ag and Se-Ge precursor layers in the non-imaged areas and the resultant Ag-Se-Ge material in the imaged areas are substantially opaque and do not transmit light. Consequently, after imagewise irradiation, the Ag layer must be removed with an acid etching process (see Figure 5 and col. 6, lns. 60-65) and then the un-doped Se-Ge layer must be removed with an alkaline etching process (see Figure 6 and col. 6, ln. 66 - col. 7, ln.4). Only after these subsequent acid and alkaline etching processes is the Block et al. device suitable for use as a mask. As explained in Figures 7-10 and col. 7, lns. 5-36, the Block et al. mask only transmits light in the regions where the Ag and Se-Ge layers have been completely removed by etching and the mask absorbs light in the regions where the resultant Ag-Se-Ge material was formed during electron beam irradiation. The resultant Ag-Se-Ge material formed during electron beam radiation is opaque just as its precursor Ag and Se-Ge layers and is not disclosed as having optical transmission characteristics that are usefully different from those of its precursor Ag and Se-Ge layers.

In contrast, claim 1 recites a photomask comprising "at least two layers of inorganic materials, wherein when heated, the inorganic materials from the at least two layers combine to form a resultant material, the resultant material having optical transmission characteristics substantially different from either of the inorganic materials from the at least two layers." Block et al. fails to disclose or suggest heating two inorganic materials to produce a resultant material having substantially different optical transmission characteristics. Block et al. teaches away from this feature by suggesting that, as opposed to different optical transmission characteristics, the resultant Ag-Se-Ge material formed by electron beam irradiation of the Ag layer and the Se-Ge layer has a different solubility in alkaline solutions.

Based on this reasoning, the Applicant submits that claim 1 patentably distinguishes Block et al. Claims 2-4, 9 and 19-29 depend from claim 1 and are submitted to patentably distinguish Block et al. for at least this reason.

Claim 10 recites a photomask comprising "first and second areas having different optical characteristics from one another, the first areas comprising a plurality of layers of different inorganic materials, the second areas comprising contiguous regions of an alloy of the inorganic materials, the alloy having a melting temperature lower than melting temperatures of the inorganic materials." This combination of features of is not disclosed or suggested by Block et al. As discussed above, the Block et al. photomask requires that the Ag and un-doped Se-Ge precursor materials be etched away after the electron beam imaging process. As shown most particularly in Figures 6 and 8, only the resultant Ag-Se-Ge material remains on the substrate when the Block et al. device is used as a photomask. Accordingly, Block et al. does not teach or suggest a photomask having the combination of "first areas comprising a plurality of layers of different inorganic materials" and "second areas comprising contiguous regions of an alloy of the inorganic materials". Furthermore, claim 10 recites that "an alloy ... having a melting temperature lower than a melting temperature of the inorganic materials." While the resultant Ag-Se-Ge material taught by Block et al. may be a combination of the Ag and Se-Ge precursor materials, Block et al. does not disclose or suggest that the Ag-Se-Ge material has a melting temperature lower than that of the Ag or Se-Ge precursor materials.

For these reasons, the Applicant submits that claim 10 patentably distinguishes Block et al. Claims 11-18 depend from claim 10, and are submitted to patentably distinguish Block et al. for at least this reason.

US Patent No. 4,082,861 (Izu et al.)

The Office Action raises Izu et al. in connection with originally filed claims 1-16. The Applicant submits that the currently pending claims patentably distinguish Izu et at.

As understood by the Applicant, Izu et al. discloses a continuous tone dry process imaging film which includes a solid, high optical density and substantially opaque film of "dispersion imaging material". Energy is applied to the dispersion imaging material to change the dispersion imaging material to a substantially fluid state in which the surface tension of the liquid dispersion imaging material causes the dispersion imaging material to disperse and change to a discontinuous film comprising openings and deformed dispersion imaging material. After the application of energy, the dispersion imaging material refreezes, but the openings remain, such that light can pass through the openings. Izu et al. discloses various means for controlling the amount of change to the discontinuous film, the area of the openings and the area of the deformed material.

The optical transmission characteristics of the entire Izu et al. device (or at most the layer containing the dispersion imaging material) may be said to change in response to the application of heat, but, as shown in Figures 3-6, and 7-10, this change of optical transmission characteristics results from the creation of openings in the layer containing the dispersion imaging material. Other than a deformation in shape, the dispersion imaging material itself is substantially the same material after being heated, melted and refrozen. The optical transmission characteristics of the dispersion imaging material itself do not change in response to the application of heat.

In contrast, claim 1 recites a photomask comprising "at least two layers of inorganic materials, wherein when heated, the inorganic materials from the layers combine to form a resultant material, the resultant material having optical transmission characteristics substantially different from either of the inorganic materials from the at least two layers." Izu et al. fails to teach or suggest this combination of features. Firstly, Izu et al. fails to teach or suggest that at least two layers of inorganic materials "combine to form a resultant

material" upon the application of heat. Izu et al. teaches the application of heat changes only the dispersion imaging material. While the dispersion imaging material may itself be a eutectic alloy, Izu et al. fails to teach or suggest that the application of heat causes at least two precursor materials to combine to form a resultant material.

Secondly, as discussed above, the optical transmission characteristics of the dispersion imaging material are substantially the same before and after the application of heat. While the optical transmission characteristics of the entire Izu et al. device may be said to change in response to the application of heat, there is no change in the optical transmission characteristics of the dispersion imaging material itself. Consequently, Izu et al. fails to teach or suggest "a resultant material ... having optical transmission characteristics substantially different from either of the inorganic materials from the at least two layers."

Based on this reasoning, the Applicant submits that claim 1 patentably distinguishes Izu et al. Claims 2-4, 9 and 19-29 depend from claim 1 and are submitted to patentably distinguish Izu et al. for at least this reason.

Claim 10 recites a photomask comprising "first and second areas having different optical characteristics from one another, the first areas comprising a plurality of layers of different inorganic materials, the second areas comprising contiguous regions of an alloy of the inorganic materials, the alloy having a melting temperature lower than melting temperatures of the inorganic materials." This combination of features of is not disclosed or suggested by Izu et al. Firstly, claim 10 recites first areas comprising layers of different inorganic materials and second areas comprising "an alloy of the inorganic materials". Izu et al. fails to teach such a feature. While the dispersion imaging material may be a eutectic alloy, Izu et al. does not disclose or suggest that the inorganic materials from which the eutectic alloy is formed are present in layers on other areas of the Izu et al. device.

Secondly, as discussed above and shown in Figures 3-6 and 11-14, Izu et al. teaches that after heating, melting and refreezing, the dispersion imaging material has openings formed therein. These openings are an essential feature of the Izu et al. device, as they permit light to flow through the opaque dispersion imaging material. The presence and necessity of these openings clearly teach away from claim 10 which recites "second areas comprising contiguous regions of an alloy of the inorganic materials."

For these reasons, the Applicant submits that claim 10 patentably distinguishes Izu et al. Claims 11-18 depend from claim 10, and are submitted to patentably distinguish Izu et al. for at least this reason.

Conclusions

In view of the amendments and comments presented above, the Applicant submits that the claims of this application patentably distinguish both Block et al. and Izu et al. and that this application is now in condition for allowance. The Applicant respectfully requests reconsideration and allowance of this application in light of the foregoing amendments and comments.

Respectfully submitted,
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